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Japanese Patent Application No. 2000-313572

Declared at Tokyo, Japan

This 30th of May, 2003

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JAPAN PATENT OFFICE

**This is to certify that the annexed is a true copy of the following application as
filed with this office.**

Date of Application: October 13, 2000

Application Number: Patent Application No. 2000-313572

Applicant(s): YAZAKI CORPORATION

[Name of the Document]	Patent Application
[Identification Number]	YZK-5161
[Filing Date]	October 13, 2000
[Addressee]	Commissioner, Patent Office
[International Patent Classification]	H01R 43/048 H01R 4/18
[Title of Invention]	STRUCTURE OF MOUNTING TERMINAL TO COVERED ELECTRIC WIRE AND METHOD THEREOF
[Number of claim(s)]	5
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[Indication of Fee]
[Prepayment Register Number] 001982
[Amount of Fee] ¥21,000

[List of Filed Material(s)]
[Name of Material] Specification 1
[Name of Material] Drawings 1
[Name of Material] Abstract 1
[Number of General Power-of-Authority] 9708734

[Request for Proof] Yes

[Name of Document] SPECIFICATION

[Title of the Invention] STRUCTURE OF MOUNTING TERMINAL TO COVERED ELECTRIC WIRE AND METHOD THEREOF

[Claim for a Patent]

[Claim 1] A structure of mounting a terminal to a covered electric wire in which a terminal portion of the covered electric wire is accommodated in a terminal accommodation portion of the terminal equipped with the cylindrical terminal accommodation portion to perform caulking, wherein

the terminal portion of the covered electric wire is uncovered by a dimension shorter than a length accommodated in the terminal accommodation portion to expose a core wire, and the terminal accommodation portion is compressed uniformly in a radius direction extending to all the periphery, and an inner surface of the terminal accommodation portion comes into contact with the core wire with a plastic deformation.

[Claim 2] A structure of mounting a terminal to a covered electric wire according to claim 1, wherein the terminal accommodation portion is of a cylindrical shape and extended in an axial direction in a state of accommodating the terminal portion of the covered electric wire.

[Claim 3] A structure of mounting a terminal to a covered electric wire according to claim 1 or 2, wherein a plurality of projection portions are formed on an internal surface of the terminal accommodation portion and bit into the covered wire and the core wire in a state of accommodating the terminal portion of the covered electric wire.

[Claim 4] A method of mounting a terminal to a covered electric wire in which a terminal portion of the covered electric wire is accommodated in a terminal accommodation

portion of the terminal equipped with the cylindrical terminal accommodation portion to perform caulking, wherein

a top portion of the covered electric wire is uncovered by a dimension shorter than a length accommodated in the terminal accommodation portion to expose a core wire, and after the top portion is inserted into the terminal accommodation portion, the terminal accommodation portion is pressurized uniformly in a radius direction extending to all the periphery, and the terminal accommodation portion and the core wire are compressed so as to cause a plastic deformation.

[Claim 5] A method of mounting a terminal to a covered electric wire according to claim 4, wherein a compression of the terminal accommodation portion is carried out by means of a swaging machine.

[Detailed Description of the Invention]

[0001]

The present invention relates to a structure of mounting a terminal to a covered electric wire and a method of mounting the terminal thereto, and more specifically to a structure of mounting a terminal to a covered electric wire and a method of mounting the terminal thereto in which a connection terminal is mounted to the terminal of the covered electric wire in a watertight manner.

[0002]

[Prior Art]

Hitherto, as a method of mounting a terminal to a covered electric wire, there has been known a method in which a pair of pressure contact blades are formed in a terminal, and a covered electric wire is entered under pressure between the

pressure contact blades, so that a conductor is energized to the pressure contact blades; and also a pair of contact bonding pieces formed in the terminal are bent and contact-bonded so as to envelop the covered portion, whereby the terminal is mounted to the covered electric wire.

[0003]

Further, as another known method of mounting a terminal to a covered electric wire, as shown in Figs. 11 and 12, Japanese Patent Laid-Open No. 2000-21543 discloses a method of caulking a terminal. As shown in Fig. 11, a connecting terminal 1 has a structure that a cylindrical terminal accommodation portion 2 for accommodating an electric wire terminal and a connecting portion 3 used for connecting with another connecting terminal are integrally formed. In this caulking method, a conductor 6 exposed by peeling an insulating covering 5 of a covered electric wire 4 off is inserted into the terminal accommodation portion 2. In a state that the conductor 6 is inserted into the terminal accommodation portion 2, the terminal accommodation portion 2 is caulked by a pressurizing force from six directions by use of a pair of dies 7, 8 shown in Fig. 12, thereby mounting the terminal. As this result, a cross-sectional shape of the terminal accommodation portion 2 which envelops the conductor 6 becomes a substantial hexagon.

[0004]

[Problems to be Solved by the Invention]

However, in the above-described method of mounting a terminal and a method of caulking the terminal, there are the problems that as the conductor of the covered electric wire is exposed, the conductor is exposed to an air or water, so that the conductor becomes easy to oxidize..

[0005]

Further, in the above-described method of caulking the terminal, as the terminal accommodation portion 2 is caulked by a pressurizing force from the six directions, the connecting terminal 1 or the conductor 6 is not uniformly deformed, and the deformation goes to a shape of stress concentration. For this reason, a gap easily locally occurs between the connecting terminal 1 and the conductor 6, and an air or water is entered into the gap, so that there occurs the problem that the conductor 6 or an internal surface of the terminal accommodation portion 2 is easy to oxidize. If a gap occurs between the connecting terminal 1 and the conductor 6, there was the problem that an electric resistance value is unstable. Further, if the conductor 6 or the internal surface of the terminal accommodation portion 2 is easy to oxidize, there was the problem that the electric resistance value is lowered.

[0006]

It is an object of the present invention to provide a structure of mounting a terminal to a covered electric wire and a method of mounting the terminal thereto having a stable electric resistance value and a high water proofing property.

[0007]

[Means for Solving the Problems]

According to a first aspect of the present invention, in the structure of mounting a terminal to a covered electric wire in which a terminal portion of the covered electric wire is accommodated in a terminal accommodation portion of the terminal equipped with the cylindrical terminal accommodation portion to perform caulking, the terminal portion of the covered electric wire is uncovered by a dimension shorter than a length

accommodated in the terminal accommodation portion to expose a core wire, and the terminal accommodation portion is compressed uniformly in a radius direction extending to all the periphery, and an inner surface of the terminal accommodation portion comes into contact with the core wire with a plastic deformation.

[0008]

According to the first aspect of the present invention, with such the arrangement, the internal surface of the terminal accommodation portion and the core wire are subjected to a plastic deformation, so that they are bit into each other. Thus, a contact area therebetween is increased and a connection resistance between the terminal and the covered electric wire is reduced. As the contact is stabilized, this leads to an action of stabilizing a resistance value. Further, as the terminal accommodation portion is compressed uniformly in a radius direction extending to all the periphery, the internal surface of the terminal accommodation portion is brought into pressure contact with the covering, thereby restricting an entrance of an air into the terminal accommodation portion. This contact has an action of preventing the entrance of water. For this reason, it is possible to offer a prevention function to a terminal mounting structure, thereby leading to an action of restricting an oxidation and a deterioration in the core wire and the internal surface of the terminal accommodation portion. As the results, it is possible to increase durability in the terminal mounting structure of the covered electric wire.

[0009]

Further, according to a second aspect of the present invention, in the structure of mounting a terminal to a covered electric wire according to claim 1, the terminal accommodation portion is of a cylindrical shape and extended in an axial

direction in a state of accommodating the terminal portion of the covered electric wire.

[0010]

Accordingly, according to the second aspect of the present invention, in addition to the action according to the first aspect of the present invention, as the terminal accommodation portion is of a cylindrical shape, it is easy to apply a uniform pressure force to an outer periphery. It is possible to avoid a situation that a stress concentration occurs in a conductor composed of the internal surface of the terminal accommodation portion and the core wire, and to cause a uniform plastic deformation with respect to the internal surface of the terminal accommodation portion and the core wire.

[0011]

According to a third aspect of the present invention, in the structure of mounting a terminal to a covered electric wire according to claim 1 or 2, a plurality of projection portions are formed on an internal surface of the terminal accommodation portion and bit into the covered wire and the core wire in a state of accommodating the terminal portion of the covered electric wire.

[0012]

According to the third aspect of the present invention, with such the arrangement, in addition to the action according to the first or second aspect of the present invention, the plurality of projections of the terminal accommodation portion are bit into the covering and the core wire, so that a contact area per unit length between the terminal accommodation portion and the core wire is increased and a connection resistance between the terminal and the covered electric wire is reduced.

As a contact is stabilized, this leads to an action of stabilizing more a resistance value. Further, as the plurality of projection portions are bit into the terminal of the covered electric wire, respectively, an adhesion of the terminal accommodation portion to the covered electric wire is raised to reliably connect the terminal with the covered electric wire.

[0013]

According to a fourth aspect of the present invention, in the method of mounting a terminal to a covered electric wire in which a terminal portion of the covered electric wire is accommodated in a terminal accommodation portion of the terminal equipped with the cylindrical terminal accommodation portion to perform caulking, a top portion of the covered electric wire is uncovered by a dimension shorter than a length accommodated in the terminal accommodation portion to expose a core wire, and after the top portion is inserted into the terminal accommodation portion, the terminal accommodation portion is pressurized uniformly in a radius direction extending to all the periphery, and the terminal accommodation portion and the core wire are compressed so as to cause a plastic deformation.

[0014]

According to the fourth aspect of the present invention, with such the arrangement, the internal surface of the terminal accommodation portion and the core wire are subjected to a plastic deformation, and bit into each other. Thus, a contact area therebetween is increased and a connection resistance between the terminal and the covered electric wire is reduced. As the contact is stabilized, this leads to an action of stabilizing a resistance value. Further, as the terminal accommodation portion is compressed uniformly in a radius direction extending to all the periphery, the internal surface

of the terminal accommodation portion is brought into contact with the covering and the contact is caused to restrict an entrance of an air into the terminal accommodation portion. Further, the contact has an action of preventing the entrance of water. For this reason, in this method, a prevention function can be offered to the terminal mounting structure and has an action of restricting an oxidation or a deterioration on the core wire and the internal surface of the terminal accommodation portion. As this result, durability in the terminal mounting structure of the covered electric wire can be raised.

[0015]

Further, according to a fifth aspect of the present invention, in the method of mounting a terminal to a covered electric wire according to claim 4, a compression of the terminal accommodation portion is carried out by means of a swaging machine.

[0016]

Accordingly, according to the fifth aspect of the present invention, it is possible to uniformly compress the terminal accommodation portion extending to all the periphery by the swaging machine, and to easily form the covered electric wire provided with a water proofing property in the terminal mounting structure.

[0017]

[Preferred Embodiments]

Hereinafter, a structure of mounting a terminal to a covered electric wire and a method of mounting the terminal will be described in detail with reference to the drawings and

embodiments according to the present invention.

[0018]

<First Embodiment>

Fig. 1 is a perspective view showing a structure of mounting a terminal to a covered electric wire according to a first embodiment, Fig. 2 is a cross-sectional view in a portion of the structure of mounting the terminal, Fig. 3 is a cross-sectional view taken along a line A-A in Fig. 2 and Fig. 4 is a cross-sectional view taken along a line B-B in Fig. 2.

[0019]

In a terminal mounting structure according to the first embodiment, a connecting terminal 11 shown in Figs. 1 and 2 is employed. The connecting terminal 11 is integrally constituted by a terminal accommodation portion 12 having a rear cylindrical shape to open, and a cylindrical connecting portion 13 of which a front portion is open. The connecting terminal 11 is provided with an outward protruding flange 14 near a center in the vicinity of a boundary between the terminal accommodation portion 12 and the connecting portion 13. The connecting terminal 11 mentioned above is formed with a conductive metal suitable for a plastic working.

[0020]

Further, in the terminal mounting structure of the first embodiment, a covered electric wire 15 is brought into pressure contact with the terminal accommodation portion 12. Specifically, by a swaging processing of uniformly caulking the covered electric wire 15 and the terminal accommodation portion 12 from the entire peripheral direction of the terminal accommodation portion 12 in a state of inserting the covered

electric wire 15 into the terminal accommodation portion 12, a diametrical dimension of the terminal accommodation portion 12 is compressed. As this result, as will be explained later in the terminal mounting method, a dimension in a length direction is stretched more than that before processed by the swaging processing.

[0021]

As shown in Fig. 2, a guiding tapered plane 16 is formed near a center on an inside surface of a cylindrical hole opening portion in the terminal accommodation portion 12. This guiding tapered plane 16 is caused to facilitate a work of accommodating the covered electric wire 15 into the terminal accommodation portion 12 in the terminal mounting method to be described below. As shown in Fig. 2, in the terminal of the covered electric wire 15, a covering 17 made of an insulating resin is peeled off by a predetermined dimension (a dimension shorter than a length which accommodates the covered electric wire 15 in the terminal accommodation portion 12) from a top end, and a core wire 18 which constitutes a conductor in the portion is exposed.

[0022]

The connecting portion 13 is screwed with the other connection terminals (not shown). Incidentally, in the first embodiment, the connecting portion 13 of a cylindrical shape to be screwed with the other connection terminal is applied, and of course, a male type connecting portion or a female type connecting portion which are just fitted on each other for connection may be applied.

[0023]

Here, a relation between the terminal accommodation portion 12 and the covered electric wire 15 and a relation

between the core wires are described by using Figs. 2 to 4.

[0024]

As shown in Figs. 2 and 3, in the terminal of the covered electric wire 15, a core wire 18 in a portion that the covering 17 is peeled off is brought into pressure contact with an internal surface of the terminal accommodation portion 12 so as to be bit into the internal surface of the terminal accommodation portion 12. For this reason, a contact area between the terminal accommodation portion 12 which is in charge of electric connection of the covered electric wire 15 to the connecting terminal 11 and the core wire 18 is increased, and a contact resistance is restricted low, and also a sheet resistance is lowered. Further, as the contact of the internal surface of the terminal accommodation portion 12 with the core wire 18 is stable, fluctuations of an electric resistance value are restricted. Further, as the contact area between the internal surface of the terminal accommodation portion 12 and the core wire 18 is increased, a gap formed between the both is decreased. As this result, an entrance of an air or water into the both is suppressed to restrict an oxidation or a deterioration in a contact surface.

[0025]

Further, as shown in Figs. 3 and 4, in a conductor composed of a bundle of the core wires 18, the core wires 18 come into pressure contact with each other so as to be bit into each other. Therefore, a contact area between the core wires 18 is increased and an electric resistance value of the entire conductor is decreased. Fluctuations of the electric resistance are restricted. Further, as the core wires 18 are bit into each other, it is difficult for an air or water to enter into the core wires 18, and the oxidation or the deterioration of the core wire 18 is restricted.

[0026]

Further, as shown in Figs. 2 and 4, as the covering 17 made of an insulating resin is brought into pressure contact with the internal surface of the terminal accommodation portion 12, the contact is caused to prevent an entrance of the air or water into the terminal accommodation portion 12. Additionally, as an end portion of a cylindrical hole opening of the terminal accommodation portion 12 is bit into the covering 17 to a direction (to a length direction of the covered electric wire 15) extending by a swaging processing, this causes to prevent the air or water from entering into the terminal accommodation portion 12.

[0027]

In the terminal mounting structure of the first embodiment with such the arrangement, as it is possible to prevent the oxidation or the deterioration on the covered electric wire 15 and the internal surface of the terminal accommodation portion 12 by providing a waterproof function, it is possible to realize the terminal mounting structure having the low and stable electric resistance value.

[0028]

Next, the method of mounting the terminal in the first embodiment will be described by using Figs. 5 and 8.

[0029]

First, as shown in Fig. 5, the connecting terminal 11 and the covered electric wire 15 are prepared. In this case, a length dimension of the terminal accommodation portion 12 in the connecting terminal 11 is set to L1. Further, a diametrical

dimension of an internal space having a generally columnar shape of the terminal accommodation portion 12 is set to be equal to or more than the diametrical dimension of the covered electric wire 15. Further, as shown in Fig. 5, in the terminal of the covered electric wire 15, the covering 17 is peeled off by dimension $L3 (>L1)$ from a top end. The covered electric wire 15 is moved in a direction shown by a bold arrow in Fig. 5, and as shown in Fig. 6, the terminal of the covered electric wire 15 is accommodated in the terminal accommodation portion 12. In this case, as the guiding tapered surface 16 is formed in the cylindrical hole opening portion of the terminal accommodation portion 12, the terminal of the covered electric wire 15 can be smoothly guided to the terminal accommodation portion 12.

[0030]

Continuously, as described above, in a state that the covered electric wire 15 is assembled to the connecting terminal 11, as shown in Fig. 7, these are set to a swaging machine 20 and the entire peripheral surface of the terminal accommodation portion 12 is subjected to a swaging processing.

[0031]

Here, an outline of the structure of the swaging machine 20 is described by using Figs. 7 and 8. Incidentally, Fig. 7 is a cross-sectional view of the swaging machine 20 in a state of setting the connecting terminal 11, and Fig. 8 is a front view of the swaging machine 20 in a state that the connecting terminal 11 is not set. This swaging machine 20 is a machine that gives a reciprocating motion in a radius direction to a plurality of sets of dies facing each other, and compresses from an outer periphery of the terminal accommodation portion 12 of the connecting terminal 11 to squeeze out in an axial direction.

[0032]

Specifically, this swaging machine 20 is generally constituted by a die 22 formed with a through hole 21 for fitting and arranging the terminal accommodation portion 12 of the connecting terminal 11, hammers 23, 23 arranged at both end portions of the die 22, respectively, a plurality of rollers 24 for moving the hammers 23, 23 in a radius direction with rotation of the die 22 and the hammers 23, 23, and an outer race for accommodating the roller 24.

[0033]

The terminal accommodation portion 12 of the connecting terminal 11 is subjected to a swaging processing by using such swaging machine 20, whereby the terminal accommodation portion 12 is pressed equally in a radius direction all over the periphery. Therefore, a radius dimension is shorter than in a state of the terminal accommodation portion 12 shown in Figs 5 and 6, and the terminal accommodation portion 12 is squeezed out to a length direction (axial direction) to extend. As this result, as shown in Fig. 2, the terminal accommodation portion 12 is extended, so that a length dimension becomes $L_2 (>L_1)$. When the terminal accommodation portion 12 is compressed in the radius direction as described above, the core wire 18 in a portion that the covering 17 is peeled off is compressed to cause a plastic deformation, so that the core wires 18 come to a state of biting into each other. Further, the core wire 18 is bit into the internal surface of the terminal accommodation portion 12, so that a contact area with the terminal accommodation portion 12 is increased. Further, the covering 17 accommodated in the terminal accommodation portion 12 is compressed in the radius direction, and an adhesion to the internal surface of the terminal accommodation portion 12 is raised. Further, as the end portion of the cylindrical hole opening of the terminal accommodation portion 12 is extended in the length direction

(axial direction), an end plane of the cylindrical hole opening is bit into the covering 17 in the length direction. The covering 17 made of an insulating resin is repelled against a compression action (having a restoring force), an adhesion of the terminal accommodation portion 12 to the covered electric wire 15 is further reinforced. As this result, it is possible to attain the terminal mounting structure with high water proofing property of the covered electric wire 15.

[0034]

<Second Embodiment>

Hereinafter, a terminal mounting structure of the covered electric wire 15 will be explained in Fig. 9 according to a second embodiment of the present invention. Incidentally, the similar reference numerals are used to denote the similar constituent elements to the above-described arrangement, and the detailed description is omitted. Fig. 9 is a cross-sectional view of the terminal mounting structure of the covered electric wire 15 according to the second embodiment of the present invention.

[0035]

In the terminal mounting structure of the covered electric wire of the second embodiment, a connecting terminal 27 as shown in Fig. 9 is used. In the connecting terminal 27, a terminal accommodation portion 29 in which a rear portion of a cylindrical shape is open and the connecting portion 13 of a cylindrical shape in which a front portion thereof is open are integrally formed. In this connecting terminal 27, a flange portion 14 projected outward is formed near a center, and a guiding tapered surface 16 is formed near a center on an inside surface of a cylindrical hole opening portion in the terminal accommodation portion 12. The above-described terminal

accommodation portion 29 has a plurality of projection portions 31 projected inward from the internal surface.

[0036]

The plurality of projection portions 31 are in an annular shape and are formed along a peripheral direction on the inner surface of the terminal accommodation portion 29, respectively. The plurality of projection portions 31 are provided so as to have a predetermined pitch between neighboring projections along a longitudinal direction of the terminal accommodation portion 29. These projection portions 31 are formed so that dimensions between side surfaces 32 and 33 are gradually reduced from a proximal end to a distal end, respectively, and both the side surfaces 32, 33 come into contact with each other at the distal end to form an edge portion 35. This edge portion 35 causes the covering 17 and the core wire 18 to easily bite into each other by the plurality of projection portions 31 described below.

[0037]

Incidentally, the plurality of projection portions 31 are formed annularly along a peripheral direction of the terminal accommodation portion 29, respectively, but the plurality of projection portions 31 may be formed annularly as a whole by providing a plurality of pieces along the peripheral direction. Further, the projection portion 31 may be formed in a rectangular section. Incidentally, the plurality of projection portions 31 are provided so as to have a predetermined pitch along a longitudinal direction of the terminal accommodation portion 29, but may be formed as a spiral projection portion connected between the neighboring projections.

[0038]

In the terminal mounting structure of the covered electric wire 15 which used such the connecting terminal 27, as shown in Fig. 9, the covering 17 of the covered electric wire 15 is peeled off by a predetermined dimension from a distal end thereof, and the covering 17 and the core wire 18 of the terminal of the covered electric wire 15 are bit by the plurality of projection portions 31, so that the internal surface of the terminal accommodation portion 29 is brought into pressure contact therewith. For this reason, the terminal accommodation portion 29 is in charge of an electric connection of the covered electric wire 15 with the connecting terminal 11, and a contact area per unit length between the terminal accommodation portion 29 and the core wire 18 is increased. A contact resistance is restricted low and a sheet resistance is also lowered. Further, in the terminal accommodation portion 29, as the plurality of projection portions are bit into the terminal of the covered electric wire 15, an adhesion to the covered electric wire 15 is raised and the covered electric wire 15 can reliably be connected. As this result, even when an unintentional force is applied to the covered electric wire 15 in a direction of pulling it out from the terminal accommodation portion 29, a connection state with the covered electric wire 15 can be reliably held.

[0039]

Further, as the contact of the terminal accommodation portion 29 with the core wire 18 is stable, fluctuations of the electric resistance value is restricted. Further, as the contact area between the internal surface of the terminal accommodation portion 29 and the core wire 18 is increased, a gap formed between the both is reduced. As this result, it is possible to restrict an entrance of an air or water between the both and to restrict an oxidation or a deterioration of the contact surface.

[0040]

Further, as the conductor formed by a bundle of the core wires 18, as the core wires 18 come into pressure contact with each other so as to be bit into each other (not shown), the contact area between the core wires 18 is large and the electric resistance value of the entire conductor is small. Fluctuations of an electric resistance are restricted. Further, as the core wires 18 are bit into each other, it is difficult for the air or water to enter between the core wires 18 and to restrict the oxidation or the deterioration of the core wire 18.

[0041]

Further, as shown in Fig. 9, as the projection portion 31 of the terminal accommodation portion 29 is bit into the covering 17, an adhesion of the internal surface of the terminal accommodation portion 29 to the covering 17 is raised to prevent an air or water from entering into the terminal accommodation portion 29. Additionally, as the end portion of the cylindrical hole opening of the terminal accommodation portion 29 is bit into the covering 17 to a direction extending by the swaging processing, the end portion is caused to prevent an air or water from entering into the terminal accommodation portion 29.

[0042]

In the terminal mounting structure of the second embodiment with such the arrangement, it is possible to prevent the oxidation or the deterioration of the covered electric wire 15 and the internal surface of the terminal accommodation portion 29 by providing a waterproof function, and to reliably connect the covered electric wire 15 with the terminal accommodation portion 29. Therefore, it is possible to realize

the terminal mounting structure which is low and stable in the electric resistance value.

[0043]

Next, the method of mounting the terminal in the second embodiment will be described by using Figs. 9 and 10.

[0044]

First, as shown in Fig. 10, a connecting terminal 29 and the covered electric wire 15 are prepared. In this case, the plurality of projection portions 31 are set so that a diametric dimension of each distal end is equal to or more than that of the covered electric wire 15. Further, a length dimension of the terminal accommodation portion 12 in the connecting terminal 11 is set to $L1$. Further, the covering 17 of the terminal of the covered electric wire 15 is peeled off by dimension $L3$ ($<L1$) from the distal end.

[0045]

The covered electric wire 15 is moved in a direction shown by a bold arrow in Fig. 10 and the terminal of the covered electric wire 15 is accommodated in the terminal accommodation portion 29 (not shown).

[0046]

Continuously, as described above, in a state that the covered electric wire 15 is assembled to the connecting terminal 29, they are set to the swaging machine and are subjected to a swaging processing from all the peripheral surface of the terminal accommodation portion 29 (not shown).

[0047]

As this result, as shown in Fig. 9, a diametrical dimension of the terminal accommodation portion 29 is shorter than a state of the terminal accommodation portion 29 shown in Fig. 10, and a length dimension comes to $L2 (>L1)$ by extension. As described above, when the terminal accommodation portion 29 is compressed in a radius direction, the plurality of projection portions 31 are bit into the covering 17 and the core wire 18, respectively, and the core wire 18 is compressed to cause a plastic deformation, and they are bit into each other. For this reason, a contact area between the terminal accommodation portion 29 and the core wire 18 is increased and an adhesion of the terminal accommodation portion 29 to the covered electric wire 15 is raised, thereby reliably connecting the terminal accommodation portion 29 with the covered electric wire 15.

[0048]

Further, as the projection portion 31 of the terminal accommodation portion 29 is bit into the covering 17, an adhesion of the internal surface of the terminal accommodation portion 29 to the covering 17 is raised and caused to prevent an air or water from entering into the terminal accommodation portion 29.

[0049]

Further, the covering 17 accommodated in the terminal accommodation portion 29 is compressed in a radius direction, thereby increasing the adhesion of the covering 17 to the projection portion 31 of the terminal accommodation portion 29. Further, as the end portion of the cylindrical hole opening of the terminal accommodation portion 29 is extended to a length direction (axial direction), the end portion of the cylindrical hole opening is bit into the covering 17 in a length direction. As the covering 17 made of an insulating resin is repelled

against these compression actions (having a restoring force), the adhesion of the terminal accommodation portion 29 to the covered electric wire 15 is further reinforced. As this result, it is possible to attain the terminal mounting structure having a high water proofing property in the covered electric wire 15.

[0050]

Hereinbefore, the embodiments were described, and the present invention is not limited to the embodiments, but various modifications annexed to the effect of the arrangement are possible.

[0051]

For example, in the above-described embodiments, a shape of the terminal accommodation portions 29, 29 in the connecting terminal 11 is formed as a cylindrical shape, but it is possible to form an angular cylindrical shape in the range of compressing uniformly in a radius direction all over the outer periphery. Further, in the above-described embodiments, the conductor obtained by bundling the plurality of core wires 18 was applied to the embodiments, but a conductor of a single wire may be applied thereto. In this case, similarly to the above-described embodiments, contact stability with the internal surface of the terminal accommodation portions 29, 29 can be attained.

[0052]

[Effect of the Invention]

As is apparent from the above description, according to the first aspect of the present invention, a connection resistance between the terminal and the covered electric wire is reduced. As the contact is stabilized, this leads to an

effect of stabilizing a resistance value. Further, according to the first aspect of the present invention, as the internal surface of the terminal accommodation portion is brought into pressure contact with the covering, thereby restricting an entrance of an air or water into the terminal accommodation portion. Therefore, it is possible to offer a prevention function to a terminal mounting structure, thereby leading to an effect of raising an oxidation resistance or durability in the core wire or the internal surface of the terminal accommodation portion.

[0053]

According to the second aspect of the present invention, in addition to the effect according to the first aspect of the present invention, as a uniform pressure force is easy to apply all over an outer periphery of the terminal accommodation portion, and it is possible to avoid a situation that a stress concentration occurs in a conductor composed of the internal surface of the terminal accommodation portion and the core wire, there occurs an effect that a uniform plastic deformation is caused with respect to the internal surface of the terminal accommodation portion and the core wire, thereby preventing occurrence of a gap.

[0054]

According to the third aspect of the present invention, in addition to the effect according to the first or second aspect of the present invention, a contact area per unit length between the terminal accommodation portion and the core wire can be increased and a connection resistance between the terminal and the covered electric wire can be reduced. Further, according to the third aspect of the present invention, an adhesion of the terminal to the covered electric wire is raised to reliably connect the terminal with the covered electric wire. When an

unintentional force is applied to the covered electric wire as well, it is possible to reliably hold a connection state of the terminal to the covered electric wire.

[0055]

According to the fourth aspect of the present invention, there occurs an effect that as a connection resistance between the terminal and the covered electric wire is reduced and the contact is stabilized, this causes to stabilize a resistance value. Further, according to the third aspect of the present invention, the internal surface of the terminal accommodation portion is brought into contact with the covering to restrict an entrance of an air into the terminal accommodation portion, and there occurs an effect that the entrance of water is prevented. For this reason, in this method, a prevention function can be offered to the terminal mounting structure and has an effect of restricting an oxidation or a deterioration on the core wire and the internal surface of the terminal accommodation portion. As this result, durability in the terminal mounting structure of the covered electric wire can be raised.

[0056]

According to the fifth aspect of the present invention, it is possible to uniformly compress the terminal accommodation portion extending to all the periphery by the swaging machine, and there occurs an effect that the covered electric wire provided with a water proofing property can easily be formed in the terminal mounting structure.

[Brief Description of the Drawings]

[Fig. 1]

Fig. 1 is a perspective view showing a structure of mounting a terminal to a covered electric wire according to a first embodiment of the present invention;

[Fig. 2]

Fig. 2 is a cross-sectional view showing a state that the terminal mounting structure according to the first embodiment is axially cut off;

[Fig. 3]

Fig. 3 is a cross-sectional view taken along a line A-A in Fig. 2

[Fig. 4]

Fig. 4 is a cross-sectional view taken along a line B-B in Fig. 2;

[Fig. 5]

Fig. 5 is a cross-sectional view for explaining an essential portion showing a method of mounting the terminal according to the first embodiment;

[Fig. 6]

Fig. 6 is a cross-sectional view for explaining the essential portion showing the method of mounting the terminal according to the first embodiment;

[Fig. 7]

Fig. 7 is a cross-sectional view showing a step of caulking by a swaging machine in the method of mounting the terminal

according to the first embodiment;

[Fig. 8]

Fig. 8 is a front view of the swaging machine used in the first embodiment;

[Fig. 9]

Fig. 9 is a cross-sectional view showing a structure of mounting a terminal to a covered electric wire according to a second embodiment of the present invention;

[Fig. 10]

Fig. 10 is a cross-sectional view for explaining an essential portion showing a method of mounting the terminal according to the second embodiment;

[Fig. 11]

Fig. 11 is a side view showing a conventional structure of mounting a terminal to a covered electric wire; and

[Fig. 12]

Fig. 12 is a cross-sectional view of an electric wire showing a conventional method of mounting the terminal to the covered electric wire.

[Description of the Reference Numeral]

11: connecting terminal
12, 29: terminal accommodation portions
15: covered electric wire
17: covering

18: core wire

31: projection portion

[Name of Document] ABSTRACT

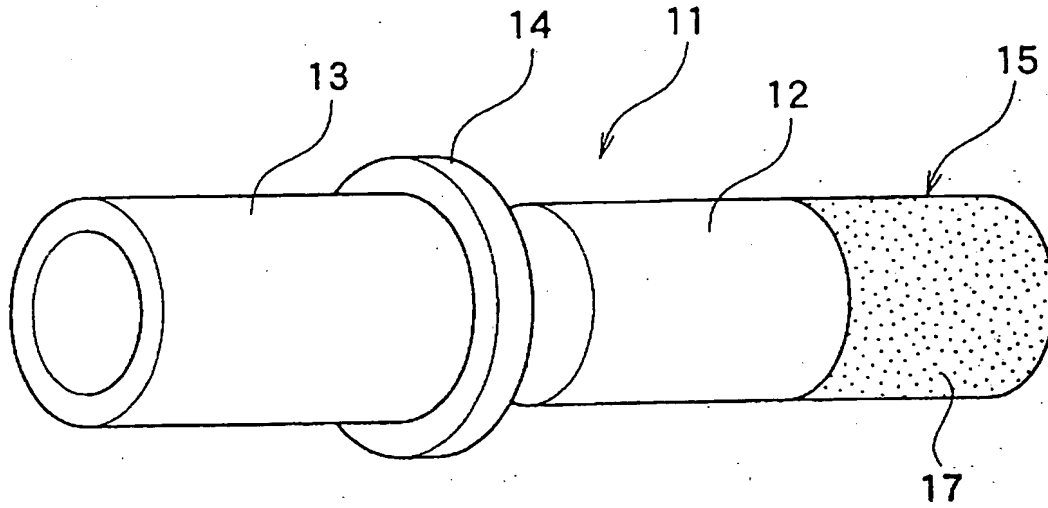
[Abstract]

[Object] To provide a structure of mounting a terminal to a covered electric wire which has a stable electric resistance value and high water proofing property and durability.

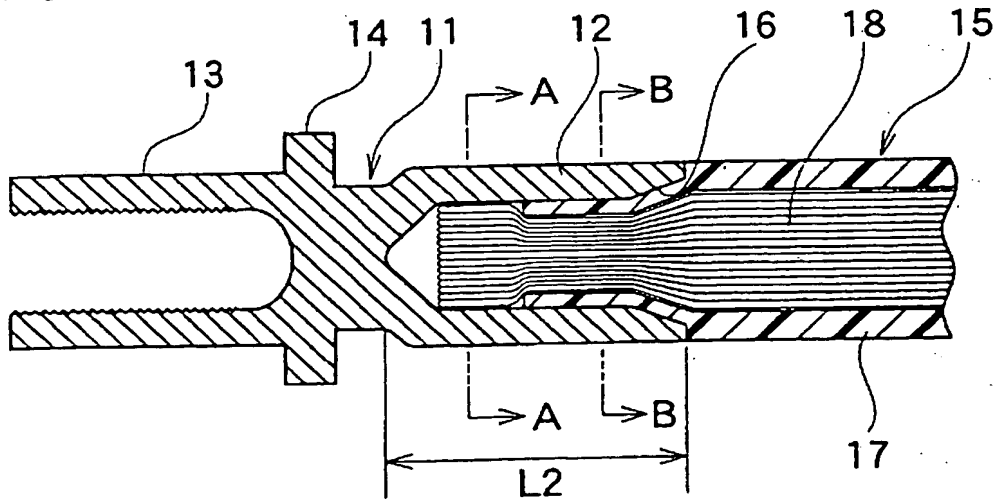
[Solving Means] In a structure of mounting a terminal to a covered electric wire 15 in which a terminal portion of the covered electric wire 15 is accommodated in terminal accommodation portions 12, 29 of a connecting terminal 11 equipped with the cylindrical terminal accommodation portions 12, 29 to perform caulking, the terminal portion of the covered electric wire 15 is uncovered by a dimension shorter than a length accommodated in the terminal accommodation portions 12, 29 to expose a core wire 18, and the terminal accommodation portions 12, 29 are compressed uniformly in a radius direction extending to all the periphery, and inner surfaces of the terminal accommodation portions 12, 29 come into contact with the core wire 18 with a plastic deformation. With such arrangement, a water proofing property between the terminal accommodation portions 12, 29 and the core wire 18 is increased, thereby attaining the structure of mounting the terminal to the covered electric wire having high durability.

[Selected Figure] Fig. 2

【書類名】 図面
[Name of Document] DRAWINGS
【図1】
[Fig. 1]



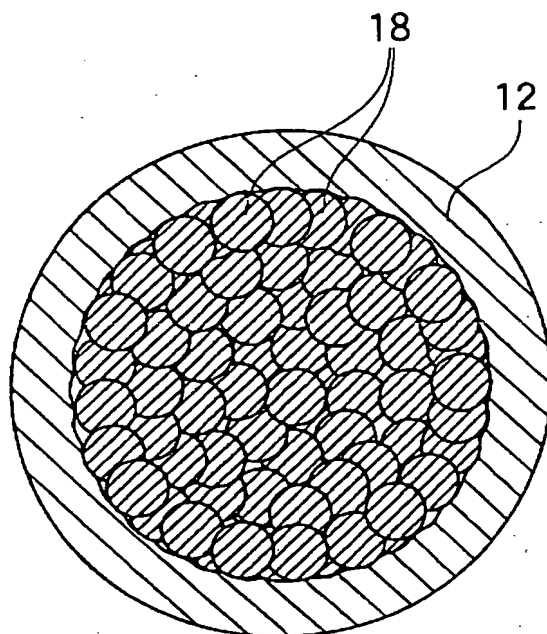
【図2】
[Fig. 2]



- | | |
|-----------|--------------------------------|
| 11: 接続端子 | CONNECTING TERMINAL |
| 12: 端末収容部 | TERMINAL ACCOMMODATION PORTION |
| 15: 被覆電線 | COVERED ELECTRIC WIRE |
| 17: 被覆 | COVERING |
| 18: 芯線 | CORE WIRE |

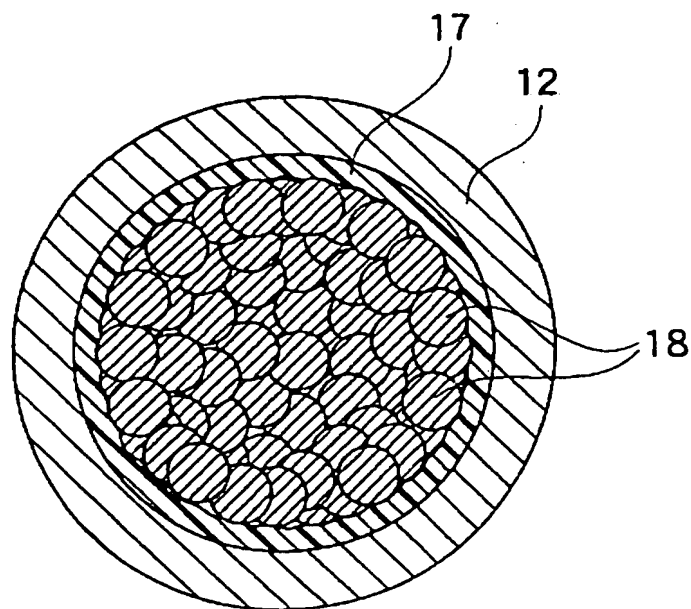
【図 3】

[Fig. 3]



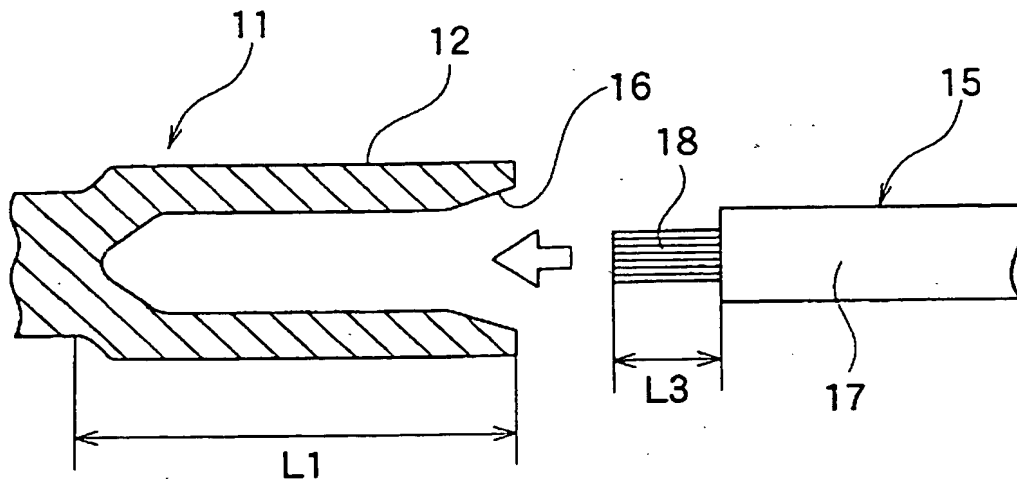
【図 4】

[Fig. 4]



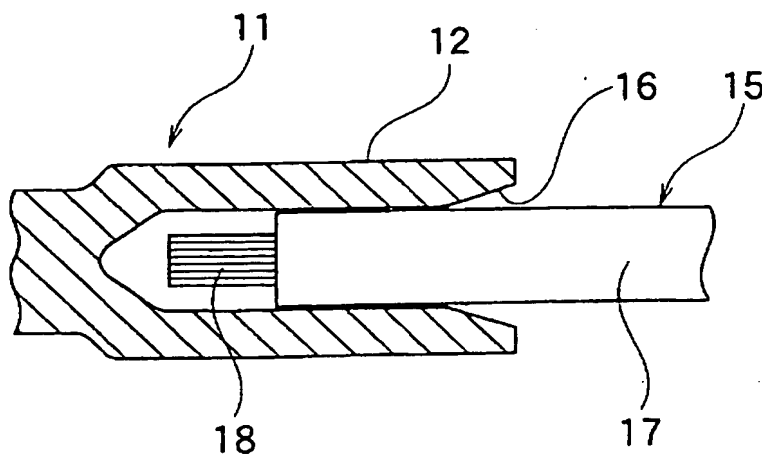
【図 5】

[Fig. 5]



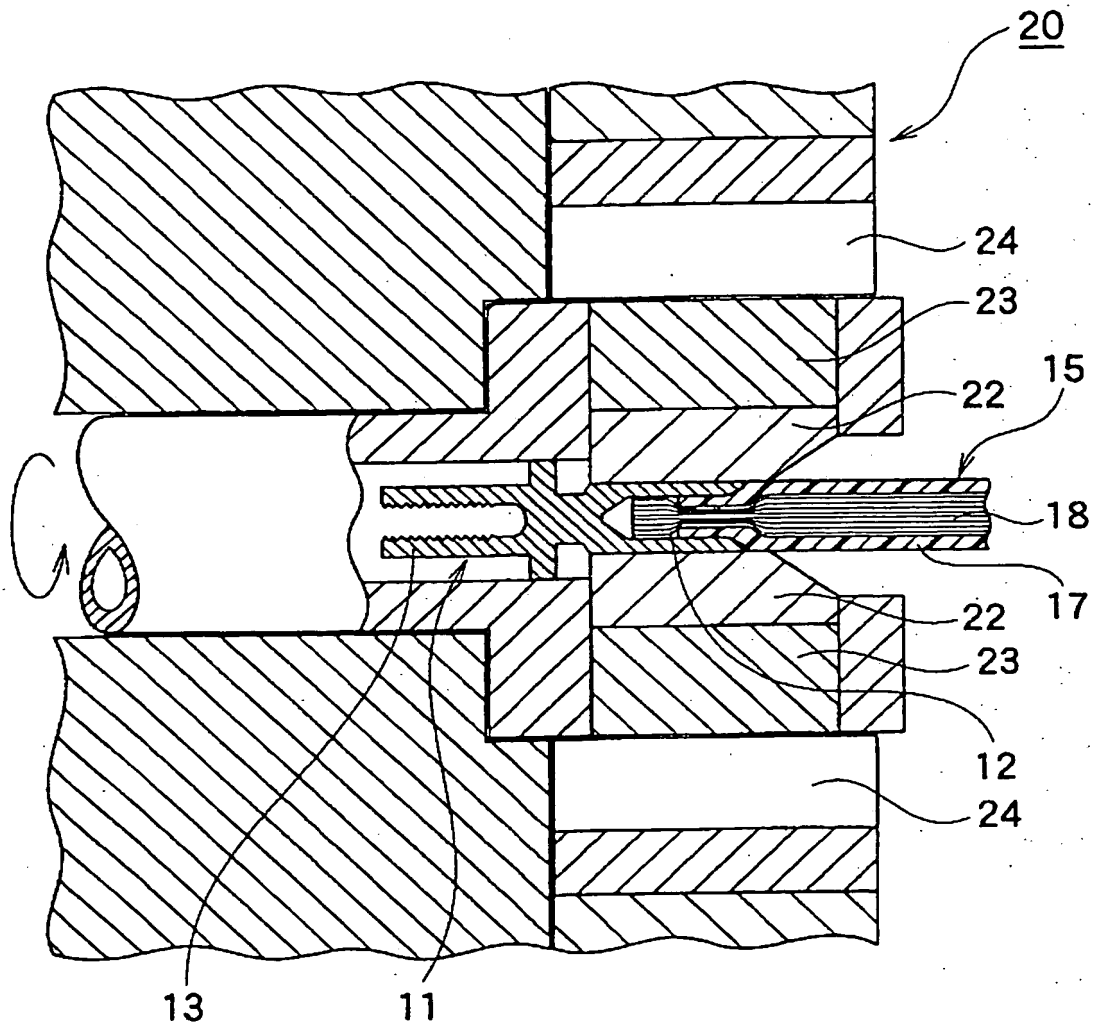
【図 6】

[Fig. 6]



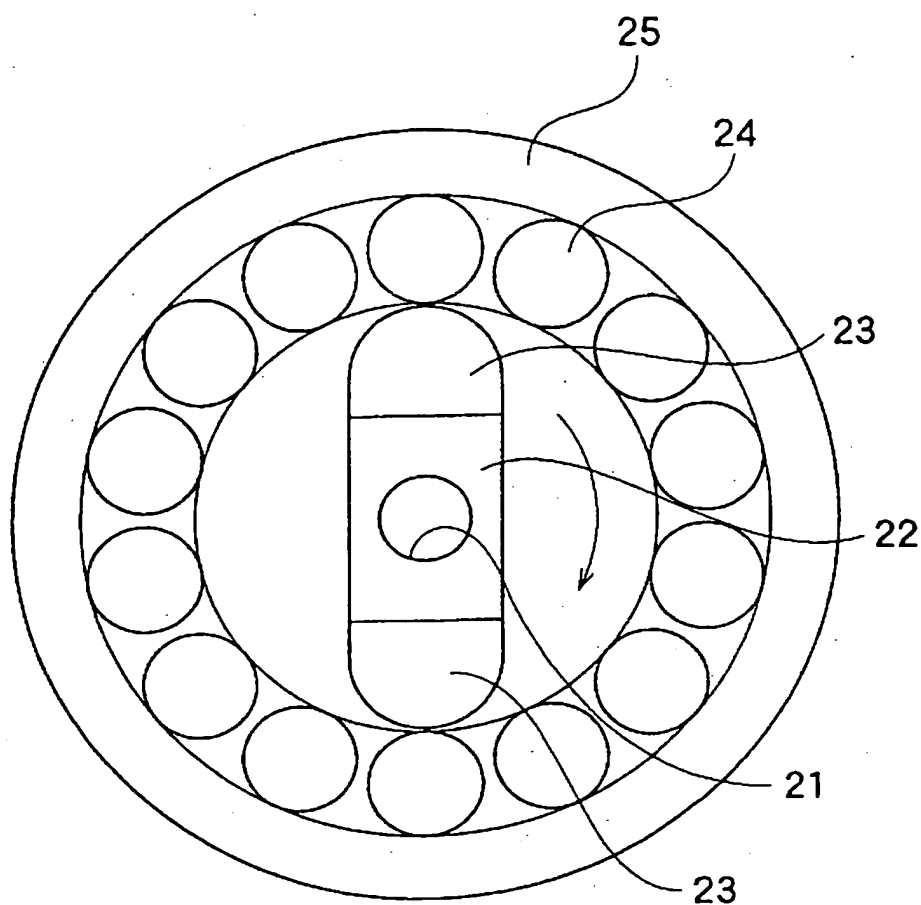
【図 7】

[Fig. 7]



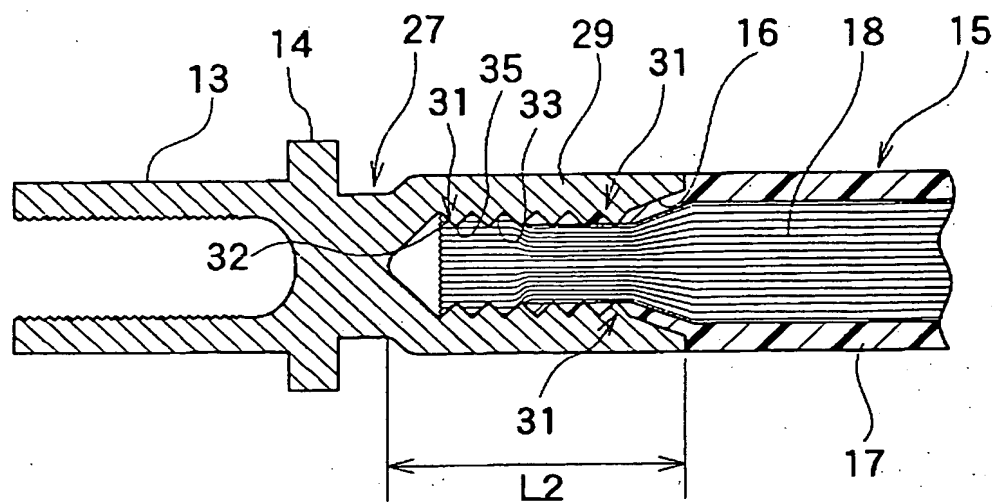
【図 8】

[Fig. 8]



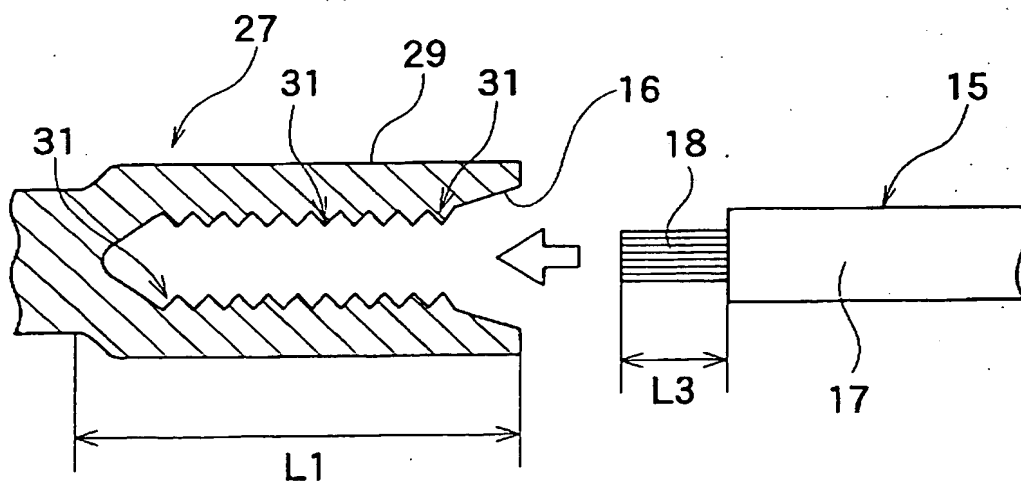
【図 9】

[Fig. 9]



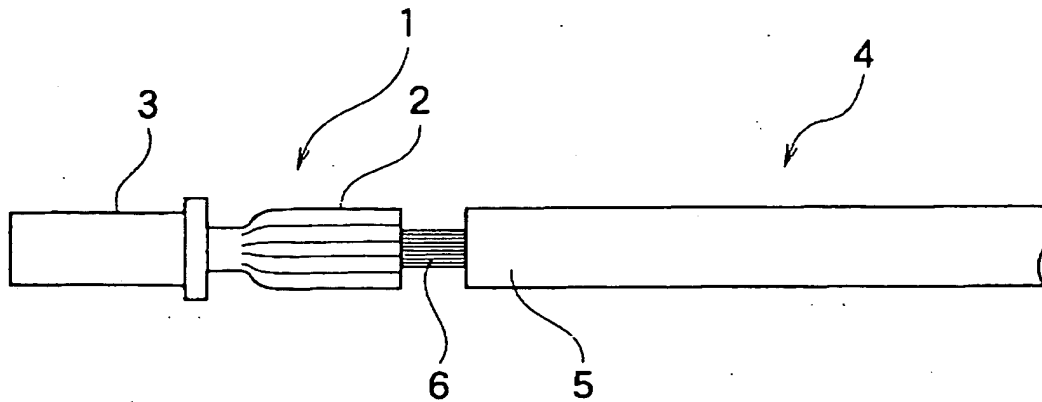
【図 10】

[Fig. 10]



【図 1 1】

[Fig. 11]



【図 1 2】

[Fig. 12]

